

CS 415 Home Work 1

Fall 2017

Due: September 9, 2017

This HW will be done in pairs. Each team will have a single submission. No sharing of code with other teams please. This HW will weigh 4 points.

Implement the algorithms for subtraction, division, exponentiation and GCD (most of this code will be provided in Python) and use them to write three functions *Problem1*, *Problem 2* and *Problem3*. problems 1 and 2 take four integers A, B, C, D in the range $0 < A, B, C, D < 1000$ and output the following: *Problem1* shall output $A^B - C^D$ (the result could be negative, your function should be able to handle this) , and *Problem2* will output the quotient and the remainder when A^B is divided by C^D . (A^B could be smaller than C^D in which case, the quotient will be 0.)

Also write a function *Problem3* that takes as input a positive integer A , $0 < A < 1000$ and outputs the numerator and the denominator of the fraction

$$1 + \frac{1}{2} + \frac{1}{3} + \dots + \frac{1}{A}$$

reduced to lowest terms. (i.e., there is no common factor between the numerator and the denominator.)

When your program is run, it should ask the user to choose an option: 1, 2, 3 or 4 (and state what these options provide).

If the user enters choice $j \in \{1, 2, 3\}$, it asks the user to enter the inputs for *problemj* and run the function *Problemj* and output the result and ask again for another option and repeat the loop until the user enters 4 at which point the program terminates.

All the computations will be done in binary using the array representation we discussed in class, but the user input and the outputs of functions *Problem1*, *Problem2* and *Problem3* will be in decimal. Code for converting from binary to decimal and from decimal to binary will be provided (in Python as well as C++). Your submission shall include the source code, and instructions for compiling and testing your program.

GCD function will be needed to reduce the fraction to lowest term in *Problem3*.

To get full-credit, the above requirements should be fully met.